

Space Weather Highlights
18-24 May 1998

Solar activity was very low to low. Sunspot regions were unremarkable during the period. Old Region 8210, the source of X-class flares and proton events during its previous rotation (see PRFs 1182 - 1184), returned to the visible disk on 22 May as a much-diminished, stable spot group and was numbered as Region 8225 (S19, L = 134, class/area Axx/010 on 25 May). Old Region 8214 (N27, L = 096, class/area Fkc/650 on 05 May) began an uneventful passage into view late on 24 May and was assigned SWO region number 8227 (N25, L = 097, class/area Dao/150 on 25 May).

Solar wind data were available from the Advanced Composition Explorer (ACE) spacecraft during most of the period. Solar sector orientation was away (phi angle near 135 degrees) during 18 - 19 May, then shifted to mostly toward orientation for the rest of the period. Bz hovered around zero and ranged from plus to minus 08 nT (GSM). Solar wind particle densities ranged from 01 - 10 p/cc while velocities ranged from 340 - 470 km/sec.

There were no significant proton enhancements observed at geosynchronous altitude.

The greater than 2 MeV electron flux at geosynchronous altitude was moderate to high during 18 - 22 May, then declined to normal to moderate levels for the balance of the period.

The geomagnetic field was quiet to unsettled during most of the summary period. Isolated, short-lived substorms occurred during local nighttime, particularly at high latitudes.

Space Weather Forecast
27 May -22 June 1998

Solar activity is expected to range from very low to low.

No proton enhancements are expected at geosynchronous altitude.

The greater than 2 MeV electron flux at geosynchronous altitude is expected to be at normal to moderate levels during most of the period.

The geomagnetic field is expected to be at quiet to unsettled levels.



Daily Solar Data

Date	Radio	Sun	Sunspot	X-ray	X-ray Flux			Flares				
	Flux 10.7 cm	spot No. (10^6 hemi.)	Area	Background	C	M	X	S	Optical			
									1	2	3	4
18 May	102	92	370	B3.0	0	0	0	0	0	0	0	0
19 May	99	77	190	B2.5	3	0	0	0	0	0	0	0
20 May	92	58	120	B4.4	0	0	0	0	0	0	0	0
21 May	89	29	60	B1.2	0	0	0	0	0	0	0	0
22 May	87	26	60	B1.2	0	0	0	0	0	0	0	0
23 May	90	47	40	B1.3	0	0	0	2	0	0	0	0
24 May	96	41	210	B1.8	1	0	0	5	0	0	0	0

Daily Particle Data

Date	Proton Fluence (protons/cm ² -day-sr)			Electron Fluence (electrons/cm ² -day-sr)		
	>1MeV	>10MeV	>100MeV	>.6MeV	>2MeV	>4MeV
18 May	1.5E+6	1.6E+4	4.4E+3		5.9E+7	
19 May	6.3E+5	1.6E+4	4.2E+3		5.3E+7	
20 May	1.3E+6	1.6E+4	4.1E+3		4.9E+7	
21 May	8.0E+5	1.5E+4	3.7E+3		3.2E+7	
22 May	5.3E+5	1.5E+4	3.9E+3		4.0E+7	
23 May	5.4E+5	1.5E+4	4.0E+3		1.8E+7	
24 May	5.7E+5	1.5E+4	3.8E+3		1.1E+7	

Daily Geomagnetic Data

Date	Middle Latitude		High Latitude		Estimated	
	Fredericksburg		College		Planetary	
	A	K-indices	A	K-indices	A	K-indices
18 May	8	2-1-1-1-3-3-3-2	26	4-1-1-2-7-3-2-2	11	3-1-2-2-4-3-3-3
19 May	*	*-*-*-*-*1-0-*	*	*-*-*-*-*1-0-*	8	2-3-2-3-2-3-1-2
20 May	8	1-1-2-2-3-2-3-2	8	1-1-2-2-3-3-2-2	9	1-0-2-3-3-3-3-2
21 May	*	*-4-3-3-2-1-3-3	*	*-3-4-5-3-3-2-2	14	3-4-3-3-3-3-3-3
22 May	6	2-1-1-2-2-2-2-1	8	3-2-1-3-2-3-1-1	8	3-1-1-2-2-3-2-2
23 May	8	3-2-3-1-2-2-2-2	10	2-1-3-3-3-2-2-3	13	3-3-4-3-3-2-3-3
24 May	15	3-3-5-2-3-2-2-2	25	2-4-6-4-4-3-2-1	16	3-3-5-2-3-3-3-2

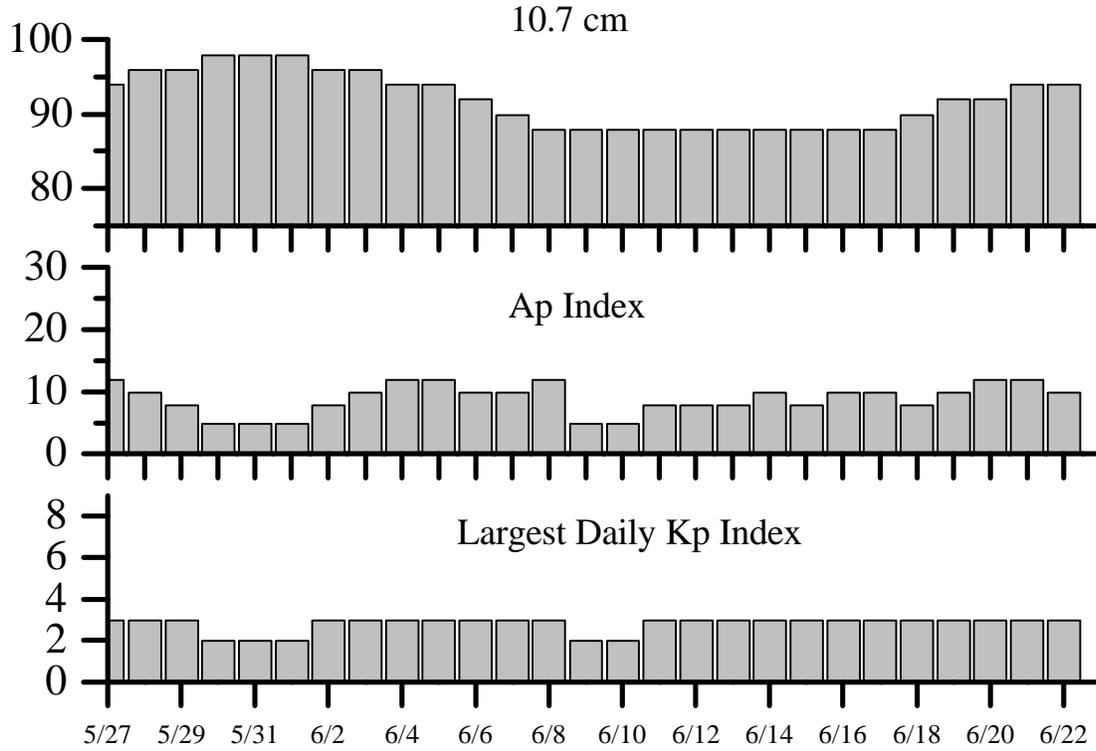


Alerts and Warnings Issued

Date and Time of Issue (UT)	Type of Alert or Warning	Date and Time of Event (UT)
18 May 1640	>2 MeV Electron Event ≥ 1000 pfu	18 May 1529
19 May 1020	Type II Radio Emission	19 May 0953
18 May 1640	>2 MeV Electron Event in Progress ≥ 1000 pfu	19 May
21 May 0000	>2 MeV Electron Event in Progress ≥ 1000 pfu	20 May
21 May 0601	K= 4 Observed	21 May 03-06
22 May 0000	>2 MeV Electron Event in Progress ≥ 1000 pfu	21 May
23 May 0013	>2 MeV Electron Event in Progress ≥ 1000 pfu	22 May
24 May 0033	>2 MeV Electron Event in Progress ≥ 1000 pfu	23 May
24 May 0607	K= 4 Observed	24 May 03-06



Twenty-seven Day Outlook



Date	Radio Flux 10.7 cm	Planetary A Index	Largest Kp Index	Date	Radio Flux 10.7 cm	Planetary A Index	Largest Kp Index
27 May	94	12	3	10 June	88	5	2
28	96	10	3	11	88	8	3
29	96	8	3	12	88	8	3
30	98	5	2	13	88	8	3
31	98	5	2	14	88	10	3
01 June	98	5	2	15	88	8	3
02	96	8	3	16	88	10	3
03	96	10	3	17	88	10	3
04	94	12	3	18	90	8	3
05	94	12	3	19	92	10	3
06	92	10	3	20	92	12	3
07	90	10	3	21	94	12	3
08	88	12	3	22	94	10	3
09	88	5	2				



Energetic Events

Date	Time (UT)		X-ray		Optical Information			Peak		Sweep Freq		
	Begin	Max	½ Max	Class	Integ Flux	Imp Brtns	Location		Radio Flux		Intensity	
							Lat	CMD	245	2695	II	IV

No events observed

Flare List

Date	Time			X-ray Class.	Optical		Rgn #
	Begin	Max	End		Imp / Brtns	Location Lat CMD	
18 May	1224	1231	1236	B9.2			
	1632	1636	1641	B5.7			
19 May	0756	0802	0804	C4.4			
	1010	1015	1018	B7.9			
	1541	1605	1634	C3.0			8218
	2324	0038	0105	C1.1			
20 May	No Flares Observed						
21 May	0317	0323	0327	B3.7			
	1344	1351	1357	B3.6			
	1701	1718	1732	B2.8			
	1930	1940	1945	B2.1			
22 May	0546	0551	0559	B2.1			
23 May	0040	0048	0100	B2.3			
	2216	2221	2226	B4.4	SF	N19W10	8226
	2322	2327	2329	B3.4			
24 May	2351	2351	2354	B3.9	SF	N18W10	8226
	0013	0016	0018	B2.9			
	0045	0050	0100		SF	N18W11	8226
	0608	0608	0618	B6.8	SF	N17W16	8226
	0732	0733	0746	B5.6	SF	N16W17	8226
	0746	0807	0817	C1.8			
	B1153	U1154	A1204		SF	N18W19	8226
	1223	1232	1238	B6.9			
	1241	1245	1302	B7.2	SF	N17W20	8226
	1758	1803	1807	B5.4			
2113	2120	2128	B5.4				



Region Summary

Date	Location		Sunspot Characteristics				Flares									
	(° Lat ° CMD)	Helio	Area (10 ⁶ hemi)	Extent (helio)	Spot Class	Spot Count	Mag Class	X-ray			Optical					
		Lon						C	M	X	S	1	2	3	4	
<i>Region 8218</i>																
06 May	S23E74	348	0010	01	AXX	002	A					3				
07 May	S22E61	348	0160	08	DSO	005	B	1	1			12				
08 May	S20E48	348	0190	10	DKI	016	B									
09 May	S19E34	348	0260	12	EAI	019	B									
10 May	S20E22	347	0220	11	ESO	014	B									
11 May	S20E08	348	0230	11	ESO	012	B					3	1			
12 May	S20W05	347	0210	12	EAI	024	B	1				4				
13 May	S20W18	347	0210	13	ESI	026	B	2				7				
14 May	S21W31	347	0180	12	ESI	024	B	1				6				
15 May	S21W45	348	0200	13	ESI	025	B	1				2				
16 May	S21W57	346	0270	14	EAC	018	B	2				3				
17 May	S20W70	345	0350	14	ESC	015	B									
18 May	S20W80	342	0190	10	DSO	011	B									
19 May	S18W90	339								1						
								9	1	0	40	1	0	0	0	0

Crossed West Limb.

Absolute heliographic longitude: 347

Region 8219

08 May	N28E41	355	0010	03	BXO	003	B									
09 May	N28E28	355														
10 May	N28E15	355														
11 May	N28E02	355														
12 May	N28W11	355														
13 May	N28W24	355														
14 May	N28W37	355														
15 May	N28W50	353														
16 May	N28W63	353														
17 May	N28W76	353														
18 May	N28W89	353														
								0	0	0	0	0	0	0	0	0

Crossed West Limb.

Absolute heliographic longitude: 355



Region Summary-continued

Date	Location		Sunspot Characteristics				Flares											
	(° Lat ° CMD)	Helio	Area (10 ⁶ hemi)	Extent (helio)	Spot Class	Spot Count	Mag Class	X-ray			Optical							
		Lon						C	M	X	S	1	2	3	4			
<i>Region 8220</i>																		
10 May	S31E82	287	0200	02	HSX	001	A	1										
11 May	S26E68	288	0130	07	CSO	005	B											
12 May	S27E57	285	0120	09	DSO	009	B											
13 May	S28E46	283	0120	10	DAO	013	B											
14 May	S27E34	282	0090	11	ESO	012	B	1				1						
15 May	S27E20	283	0080	12	ESO	020	B											
16 May	S28E07	282	0050	12	ESI	023	B											
17 May	S27W07	282	0070	13	CRO	025	B											
18 May	S27W18	280	0040	11	BXI	025	B											
19 May	S26W31	280	0030	12	BXO	015	B											
20 May	S26W47	283	0020	04	BXO	005	B											
21 May	S26W60	283	0000	02	AXX	002	A											
22 May	S24W72	282	0000	00	AXX	001	A											
23 May	S24W85	282																
								2	0	0	1	0	0	0	0	0		

Crossed West Limb.

Absolute heliographic longitude: 282

<i>Region 8222</i>																		
11 May	N20E68	288	0020	02	BXO	002	B											
12 May	N21E60	282	0080	10	DSO	005	B											
13 May	N22E48	281	0120	12	EAO	010	B											
14 May	N22E35	281	0150	12	EAI	017	BG					2						
15 May	N22E22	281	0140	12	EAO	026	B											
16 May	N22E09	280	0180	12	EAO	021	B					1						
17 May	N23W04	279	0130	12	EAO	019	B											
18 May	N22W17	279	0140	16	FAI	026	B											
19 May	N24W31	280	0140	15	CAI	017	B											
20 May	N24W41	277	0090	11	CAO	011	B											
21 May	N23W52	275	0060	07	DSO	007	B											
22 May	N24W64	274	0060	04	CAO	005	B											
23 May	N24W77	273	0010	03	BXO	004	B											
24 May	N24W90	273																
								0	0	0	3	0	0	0	0	0		

Still on Disk.

Absolute heliographic longitude: 279



Region Summary-continued

Date	Location		Sunspot Characteristics				Flares								
	(° Lat ° CMD)	Helio	Area (10 ⁶ hemi)	Extent (helio)	Spot Class	Spot Count	Mag Class	X-ray			Optical				
		Lon						C	M	X	S	1	2	3	4
<i>Region 8223</i>															
19 May	S16W53	302	0010	04	BXO	002	B								
20 May	S16W68	304	0000	00	AXX	001	A								
21 May	S16W81	304													
22 May	S16W94	304													
								0	0	0	0	0	0	0	0
Crossed West Limb.															
Absolute heliographic longitude: 302															
<i>Region 8224</i>															
19 May	S35E01	248	0010	03	BXO	003	B								
20 May	S31W10	246	0010	00	AXX	001	A								
21 May	S31W23	246													
22 May	S31W36	246													
23 May	S31W49	246													
24 May	S31W62	246													
								0	0	0	0	0	0	0	0
Still on Disk.															
Absolute heliographic longitude: 248															
<i>Region 8225</i>															
23 May	S18E62	134	0000	00	AXX	001	A								
24 May	S18E48	135	0010	00	AXX	001	A								
								0	0	0	0	0	0	0	0
Still on Disk.															
Absolute heliographic longitude: 135															
<i>Region 8226</i>															
23 May	N17W12	208	0030	04	CRO	012	B				2				
24 May	N18W28	211	0200	07	DAO	020	B				5				
								0	0	0	7	0	0	0	0
Still on Disk.															
Absolute heliographic longitude: 208															



**Recent Solar Indices (preliminary)
of the observed monthly mean values**

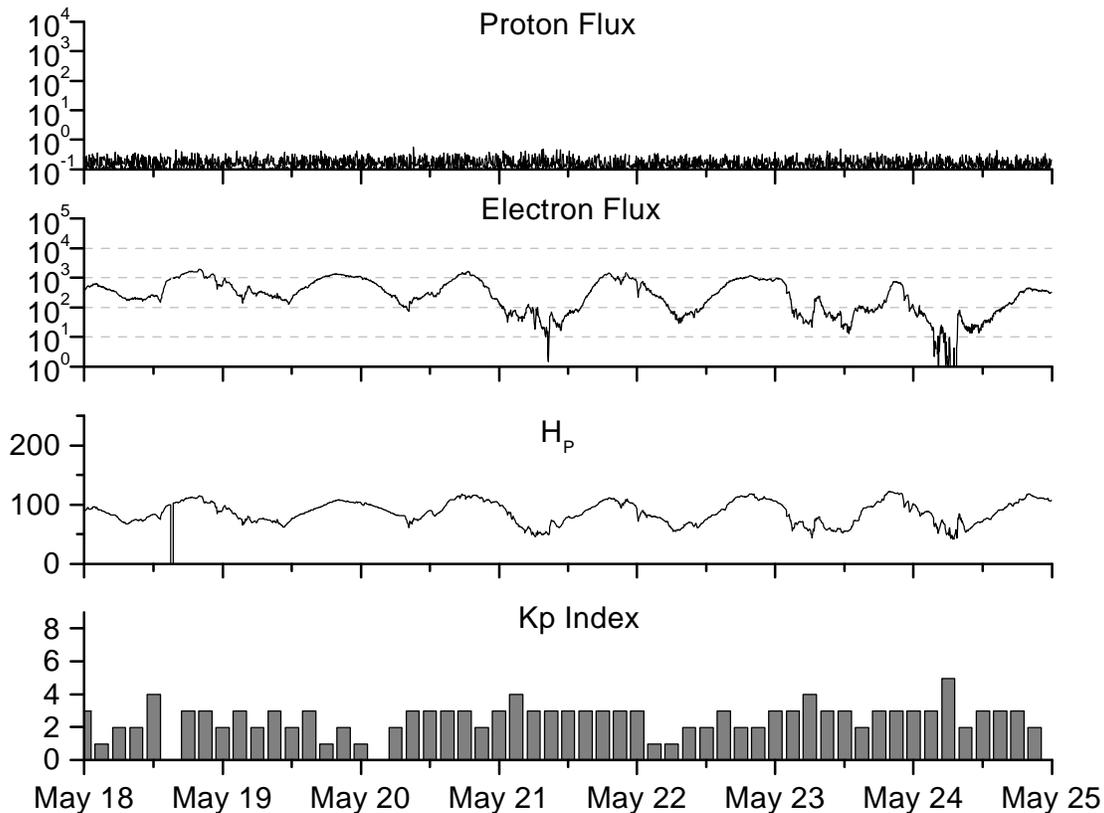
Month	Sunspot Numbers				Radio Flux		Geomagnetic		
	Observed SWO	values RI	Ratio RI/SWO	Smooth SWO	values RI	**Penticton 10.7 cm	Smooth Value	Planetary Ap	Smooth Value
1996									
May	11.8	05.5	0.47	12.9	08.0	72.1	71.4	07	09.5
June	18.8	11.8	0.63	13.5	08.5	69.6	71.8	05	09.4
July	13.2	08.2	0.62	13.4	08.4	71.2	72.0	07	09.3
August	20.5	14.4	0.70	13.1	08.3	72.4	72.1	09	09.4
September	02.9	01.6	0.55	13.3	08.4	69.4	72.3	15	09.3
October	02.3	00.9	0.39	14.0	08.8	69.2	72.6	13	09.1
November	26.7	17.9	0.67	15.4	09.8	78.7	73.0	08	09.1
December	21.1	13.3	0.63	16.2	10.4	77.8	73.3	07	09.3
1997									
January	09.0	05.7	0.63	16.5	10.5	74.0	73.4	09	09.3
February	11.3	07.6	0.67	17.4	11.0	73.8	73.7	11	09.2
March	14.4	08.7	0.60	20.4	13.5	73.5	75.1*	08	08.9
April	24.5	15.5	0.63	24.0	16.5	74.5	76.8	10	08.6
May	28.6	18.5	0.65	26.4	18.3	74.6	78.4	08	08.6
June	22.1	12.7	0.57	29.0	20.3	71.7	80.1	07	08.7*
July	17.0	10.4	0.61	32.4	22.6*	71.1	81.8*	06	08.5*
August	36.7	24.4	0.66	35.9	25.1*	79.0	83.4*	07	08.3*
September	52.8	51.3	0.88	40.5	28.4*	96.2	85.7*	10	08.2*
October	33.6	22.8	0.68	45.4	31.9*	84.9	88.6*	11	08.3*
November	53.5	39.0	0.73			99.5		11	
December	57.9	41.2	0.71			98.8		05*	
1998									
January	51.8	32.3*	0.62*			93.5*		07*	
February	54.4	40.7*	0.75*			93.6*		07*	
March	81.1	54.8*	0.67*			109.4*		11*	
April	73.6	53.3*	0.72*			108.3*		10*	

*Preliminary estimates.

The lowest smoothed sunspot indices number for Cycle 22, RI = 8.0, occurred in May 1996. The highest smoothed sunspot number for Cycle 22, RI=158.5 occurred July 1989.

** From June 1991 onward, the 10.7 cm radio flux data source is Penticton, B.C. Canada. Prior to that, it was Ottawa.





Weekly Geosynchronous Satellite Environment Summary
Week Beginning 18 May 1998

Protons plot contains the five-minute averaged integral proton flux (protons/ cm²-sec-sr) as measured by GOES-9 (W135) for each of three energy thresholds: greater than 10, 50, and 100 MeV.

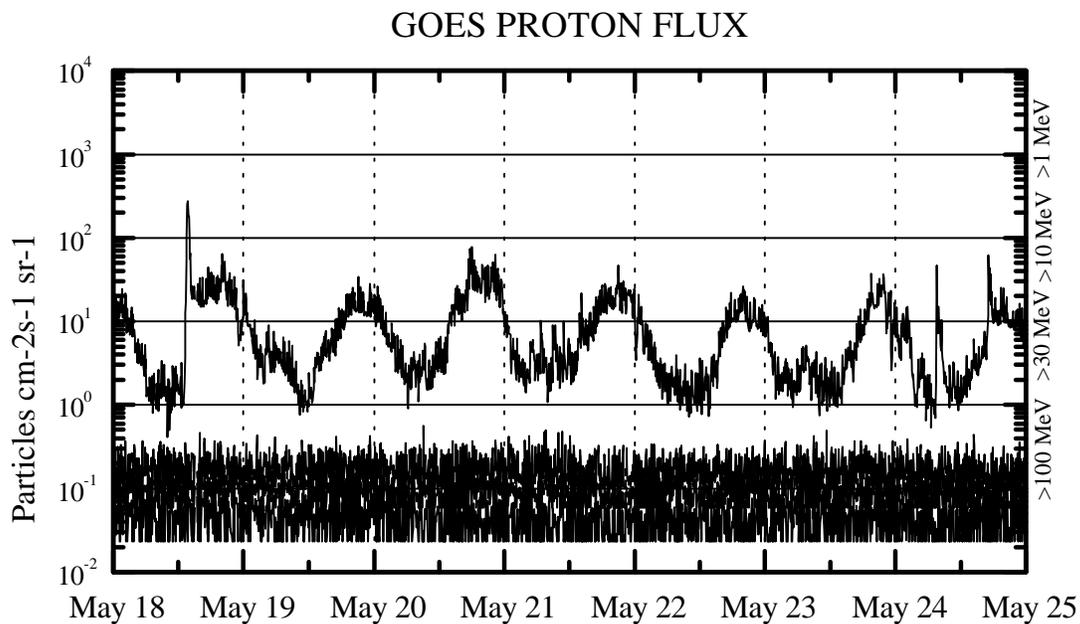
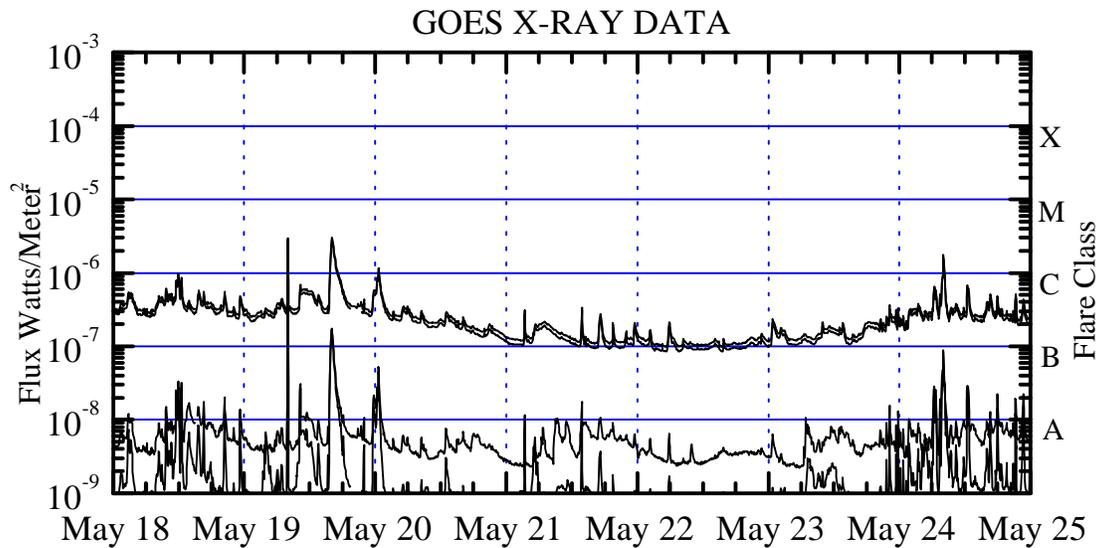
Electrons plot contains the five-minute averaged integral electron flux (electrons/ cm²-sec-sr) with energies greater than 2 MeV at GOES-9.

H_p plot contains the five minute averaged magnetic field H component in nanoteslas (nT) as measured by GOES-9. The H component is parallel to the spin axis of the satellite, which is nearly parallel to the Earth's rotation axis.

K_p plot contains the estimated planetary 3-hour K-index (derived by the USAF 55th Space Weather Squadron) in real time from magnetometers at Meanook, Canada; Sitka, AK; Glenlea, Canada; St. Johns, Canada; Ottawa, Canada; Newport, WA; Fredericksburg, VA; Boulder, CO; Fresno, CA and Heartland, UK. These data are made available through cooperation from the Geological Survey of Canada (GSC) and the US Geological Survey. These may differ from the final K_p values derived from a more extensive network of magnetometers.

The data included here are those now available in real time at the SWO and are incomplete in that they do not include the full set of parameters and energy ranges known to cause satellite operating anomalies. The proton and electron fluxes and K_p are "global" parameters that are applicable to a first order approximation over large areas. H_{parallel} is subject to a more localized phenomena and the measurements generally are applicable to within a few degrees of longitude of the measuring satellite.





Weekly GOES Satellite X-ray and Proton Plots

X-ray plot contains five minute averaged x-ray flux (watts/m²) as measured by GOES 8 and 9 in two wavelength bands, .05 -.4 and .1 -.8 nm. The letters A, B, C, M and X refer to x-ray event levels for the .1 -.8 nm band.

Proton plot contains the five minute averaged integral proton flux (protons/cm²-sec-sr) as measured by GOES-9 (W135) for each of the energy thresholds: >1, >10, >30 and >100 MeV. P10 event threshold is 10 pfu (protons/cm²-sec-sr) at greater than 10 MeV.

